

New U.S. Application
Filed: March 16, 2005
National Phase of PCT/EP2003/010329
Int'l Filing Date: 17 September 2003
PRELIMINARY AMENDMENT

Amendments to the Claims

Kindly replace original claims 1-27 with the following substitute claims. This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended) A method for arranging a polymer molecule such as a biomolecule on a support, the method comprising the following steps:

- providing a substrate (3) having a surface (2);
- providing a surface layer (4) on said surface (2) of the substrate (3), said substrate (3) and said surface layer (4) providing a support (5);
- placing a polymer molecule (1) on said surface layer (4) in a first position; and
- adsorbing the polymer molecule (1) on said surface layer (4) providing an adsorbed state of the polymer molecule (1), the polymer molecule (1) having a first conformation on said surface layer (4);

wherein said surface layer (4) is configured to adjust predefined molecular interaction between the polymer molecule (1) and said support (5) to allow fixing of the first conformation of said polymer molecule (1), and in said adsorbed state of the polymer molecule (1) dislocating at least part of the polymer molecule (1) across said surface layer (4) relative to said support (5) by an external force.

2. (currently amended) The method according to claim 1, wherein the method comprises a step for subsequently fixing the polymer molecule (1) on the surface layer (4).

3. (currently amended) The method according to claim 1 or 2, wherein the method comprises a step of dislocating in said adsorbed state the polymer molecule (1) across said surface layer (4) by manipulation of said first conformation of the polymer molecule (1) to a second conformation different from the first conformation of the polymer molecule (1), and fixing the polymer molecule (1) on the surface layer (4) in said second conformation by means of said molecular interaction between the polymer molecule (1) and said support (5).

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4. (currently amended) The method according to ~~one of the preceding claims~~ claim 1, wherein the method comprises steps of dislocating the polymer molecule (1) in said adsorbed state across said surface layer (4) by changing said first position of the polymer molecule (1) to a second position different from the first position on the surface layer (4), and fixing the polymer molecule (1) on said surface layer (4) in said second position by means of said predefined molecular interaction between the polymer molecule (1) and said support (5).
5. (currently amended) The method according to ~~one of the preceding claims~~ claim 1, the method further comprising a step of configuring said surface layer (4) to provide a force required for dislocating the polymer molecule (1) across the surface layer (4) which is smaller than about $2nN$ in dependence on the polymer molecule (1) and said substrate (3).
6. (currently amended) The method according to ~~one of the preceding claims~~ claim 1, wherein the step of providing said surface layer (4) on said surface (2) of said substrate (3) comprises a step of forming domains and/or axes and/or further binding sites in said surface layer (4).
7. (currently amended) The method according to claim 6, wherein said external force comprises an attractive force provided at least partly by said domains and/or axes and/or further binding sites in said surface layer (4).
8. (currently amended) The method according to ~~one of the preceding claims~~ claim 1, wherein said surface layer (4) is self assembling.

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9. (currently amended) The method according to ~~one of the preceding claims~~ claim 1, wherein said step for providing said surface layer (4) on said surface of said substrate (5) comprises a step for using one or more of the following methods:

- a chemical method with appearance of new chemical functionalities covalently bound to said surface (2) of said substrate (3);
- plasma-chemical method;
- thin or ultra-thin coating applied by surface adsorption method;
- thin or ultra-thin spin-coating;
- thin or ultra-thin coating applied by vacuum deposition method;
- a Langmuir-Blodgett technique or a self organized film technology;
- Layer-by-Layer polyelectrolyte assembling; and
- ~~2D-crystallization~~ crystallization of low-, middle- or high molecular weight substances or their complexes on the surface.

10. (currently amended) The method according to ~~one of the preceding claims~~ claim 1, wherein the method further comprises a step for altering said predefined molecular interaction between the polymer molecule (1) and said support (5).

11. (currently amended) The method according to claim 10, wherein said step for altering said predefined molecular interaction comprises a step for placing said surface layer (4) with the polymer molecule (1) provided thereon into a liquid medium.

12. (currently amended) The method according to claim 10 ~~or 11~~, wherein said step for altering said predefined molecular interaction comprises a step for drying said surface layer (4) with the polymer molecule (1) provided thereon.

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13. (currently amended) The method according to ~~one of the claims 10 to 12~~ claim 10, wherein said step for altering said predefined molecular interaction comprises a step for changing a temperature of said surface layer (4),

14. (currently amended) The method according to ~~one of the claims 10 to 13~~ claim 10, wherein said step for altering said predefined molecular interaction comprises a step for applying an electric or/and magnetic field oriented perpendicular or at certain angle with respect to said surface of said support (5).

15. (currently amended) The method according to ~~one of the claims 10 to 14~~ claim 10, wherein said step for altering said predefined molecular interaction comprises a step for exciting the polymer by light.

16. (currently amended) The method according to ~~one of the preceding claims~~ claim 1, wherein said external force is provided by using one of the following fields: electrical field, magnetic field, optical field and mechanical field, or any combination thereof.

17. (currently amended) The method according to ~~one of the preceding claims~~ claim 1, wherein a scanning probe microscope (SPM) is used for applying said external force.

18. (currently amended) The method according to ~~one of the preceding claims~~ claim 1, wherein the polymer molecule (1) comprises a polynucleotide such as DNA or RNA, a polypeptide such as protein, an antibody or antigen-antibody system, a polysaccharide, or a desired mixture of biomolecules.

19. (currently amended) The method according to ~~one of the preceding claims~~ claim 1, wherein said surface layer (4) comprises an inorganic polymer, an organic polymer, an organic low molecular substance, a metal, a metal oxide, a sulfide, a semiconductor, or an optical element, or any combination thereof.

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20. (currently amended) The method according to ~~one of the preceding claims~~ claim 1, wherein said substrate (5) is atomically flat.

21. (currently amended) The method according to ~~one of the preceding claims~~ claim 1, wherein said substrate (5) comprises glass, surface oxidized silicon, gold, molybdenum sulfide, highly oriented pyrolytic graphite (HOPG) or mica.

22. (currently amended) The method according to ~~one of the preceding claims~~ claim 1, wherein the method comprises a step for anchoring at least one end of the polymer molecule (1) to said support (5).

23. (currently amended) The method according to ~~one of the preceding claims~~ claim 1, wherein the method comprises a step for anchoring at least one end of the polymer molecule (1) to be arranged to a fiber, a micro-particle or a nano-particle.

24. (currently amended) A product provided according to ~~one of the claims 1 to 23~~ claim 1, said product comprising:

- a substrate (3);
- a surface layer (4) provided on a surface of said substrate (3);
- a support (5) provided by said substrate (3) and said surface layer (4); and
- a polymer molecule (1) such as a biomolecule which is adsorbed on said surface layer (4) providing an adsorbed state of the polymer molecule (1), and which is arranged on said surface layer (4) in a first conformation;

wherein said surface layer (4) is configured to adjust predefined molecular interaction between the polymer molecule (1) and said support (5) to allow in said adsorbed state fixing of the first conformation of the polymer molecule (1), dislocating at least part of the polymer molecule (1) across said surface layer (4) relative to said support (5), and subsequently fixing the polymer molecule (1) on the surface layer (4).

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25. (currently amended) Use of a method according to ~~one of the claims 1 to 23~~ claim 1 or a product according to claim 23 for recognition, detecting or analysis of a component of surrounding medium or/and of a polymer molecule (1) to be arranged.
26. (currently amended) Use of a method according to ~~one of the claims 1 to 23~~ claim 1 or a product according to claim 23 for recognition, detecting or analyzing of a molecule or chemical groups of a surface layer (4).
27. (currently amended) Use of a method according to ~~one of the claims 1 to 23~~ claim 1 or a product according to claim 24 for constructing a molecular device.